

**REMARKS**

Claim 1-36 are pending. Claims 1-9 and 16-32 have been withdrawn from consideration. New claims 33 - 36 have been added.

Claims 10-14 have been amended to recite a device that includes a substantially arbitrary arrangement of contacts, where the contacts have been defined by exposing a resist using interference lithography and etching the contacts using the resist as a guide.

In the action mailed March 22, 2005, the title and the specification were objected to. They have been amended to more specifically relate to the claims under examination.

Claims 10-15 were rejected under 35 U.S.C. § 112, second paragraph as indefinite. Claim 10 has been amended to relate to an "arrangement of contacts."

Claim 10 has also been amended to recited that the contacts in the device have a definition characteristic of interference lithography.

Former claim 10 was rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 6,042,998 to Brueck et al. (hereinafter "Brueck I").

As amended, claim 10 relates to a device that includes a substantially arbitrary arrangement of contacts. The contacts have a definition characteristic of interference lithography.

The contacts have been defined by exposing a resist using interference lithography and etching the contacts using the resist as a guide.

The Detailed Description of Brueck I only deals with periodic arrangements of features. See, e.g., FIG. 8C of Brueck I and the written description thereof. Further, there is no enabling description of a device that includes a substantially arbitrary arrangement of contacts in Brueck I. Accordingly, the rejection of claim 10 as anticipated by Brueck I is improper and should be withdrawn.

However, the rejection of claim 10 relies on a statement found in the Background of Brueck I. In particular, the Background of Brueck I refers to U.S. Patent Application Serial No. 08/786,066 as showing "an approach ... allowing higher resolution images of arbitrary patterns than are usually possible with conventional optical imaging approaches." U.S. Patent Application Serial No. 08/786,066 is the parent of U.S. Patent No. 6,233,044 to Brueck et al. (hereinafter "Brueck II"). To advance prosecution, Applicant now addresses Brueck II.

To begin with, Brueck II neither describes nor suggests a device that includes a substantially arbitrary arrangement of contacts, much less contacts with a definition characteristic of interference lithography. None of the patterns described in

Brueck II include a substantially arbitrary arrangement of contacts. Brueck II therefore does not anticipate claim 10.

Moreover, Applicant respectfully submits that the techniques described in Brueck II cannot realistically be used to form a device that includes a substantially arbitrary arrangement of contacts having a definition characteristic of interference lithography.

Brueck II deals with the addition of a generally aperiodic low spatial frequency image and a periodic high spatial frequency image to expose a single pattern in a substrate. FIG. 7 is representative of the approaches used by Brueck II. An arbitrary low spatial frequency image is produced using masks 41, 42. One or more periodic high spatial frequency images is produced using an optical system of mirrors 45, 46, 47, 48. The arbitrary low spatial frequency image is added to the high spatial frequency image(s) to yield the desired light intensity distribution. See, e.g., Brueck II, col. 13, line 55 - col. 15, line 25, Equations 11, 12, and 13, and col. 15, line 29-30 (describing how the low spatial frequency mask image is modulated by the high spatial frequency pattern).

Brueck II further indicates that the low spatial frequency image is, for practical reasons, necessary for arbitrary imaging. Referring to col. 22, lines 54-67, Brueck II states:

"imaging interferometric exposures are not restricted to periodic arrays of structures. ... Any arbitrary pattern can be described as a Fourier series, where the repetitive period is the exposure field. For typical ULSI scales, this means that there are a very large number of Fourier components that must be included (e.g., potentially on the order of 100 million). Clearly, this is unrealistic if individual Fourier components are separately exposed; but is not a problem for imaging interferometric exposures which combine the capabilities of imaging optics to deal with large numbers of frequency components and those of interferometry to allow high spatial frequencies."

Thus, it is unrealistic to form arbitrary patterns using only the individual Fourier components provided by interferometric lithography. Rather, the combination of multi-component (but low spatial frequency) imaging optics with one or more individual component (but high spatial frequency) interferometric lithography exposures realistically may allow arbitrary patterns to be formed.

Since Brueck II requires that a low spatial frequency image be added to one or more high spatial frequency images, Applicant respectfully submits that Brueck II cannot realistically be used to form a device that includes a substantially arbitrary arrangement of contacts having a definition characteristic of interference lithography. In particular, contacts formed using Brueck II's techniques will inherently require some contribution from a low spatial frequency, albeit large number of Fourier component, image. This low frequency component will inherently

limit the definition that can be achieved using the higher spatial resolution images to be below that provided by high spatial frequency interference lithography alone.

Accordingly, since Brueck I and Brueck II, alone or in combination, neither describe nor suggest a device that includes a substantially arbitrary arrangement of contacts having a definition characteristic of interference lithography, amended claim 10 is not anticipated by either Brueck I or Brueck II and the rejection should be withdrawn.

Claim 10 was also rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,548,820 to Mermelstein (hereinafter "Mermelstein").

The rejection contends that Mermelstein describes features having a definition characteristic of interference lithography.

Applicant respectfully disagrees. In Mermelstein, one or more of the phase, amplitude, and polarization of several beams of electromagnetic radiation is modified so to produce non-periodic intensity patterns on a substrate. The phase, amplitude, and polarization is modified at the source or by acoustic-optical modulators in the optical path. See Mermelstein, col. 5, line 49-57. The modified beams are then directed at a substrate from different angles.

Although the modified beams of electromagnetic radiation do interfere with one another to form the *interference pattern* of

col. 3, line 29-31 cited in the rejection, there is no reason to believe that this interference pattern yields contacts with the definition characteristic of interference lithography.

Interference is an inescapable aspect of all electromagnetic radiation. Every exposure of a substrate will thus yield an "interference pattern" of one sort or another.

Despite the inescapable nature of interference patterns, every exposure of a substrate does not produce an image having a definition characteristic of interference lithography. Support for this contention can be found in both the application as filed and the cited art. For example, page 5, line 12 - page 6, line 5 of the specification describes how interference lithography produces characteristic images. As another example, col. 5, line 30-50 of Brueck I describes that interferometric lithography allows patterns that are "substantially finer" than those available from comparable lithographic techniques to be formed using interference lithography. These "comparable lithographic techniques" form interference patterns, as in Mermelstein, and yet they are excluded from possessing the definition characteristic of interference lithography.

Further support for the contention that Mermelstein does not involve interference lithography is found in the Office action. In the rejection of claim 12, freedom from defects arising due to one or more of lens imperfections and mask

imperfections was taken as an inherent part of features formed using an interference lithography system. However, Mermelstein describes that acoustic-optical modulators (or modification at the source) can be used to modify the phase, amplitude, or polarization of electromagnetic radiation in his system. To the best of Applicant's knowledge, such modulators must include lens (or comparable) imperfections. Thus, if the contention used in rejection claim 12 is true, the presence of acoustic-optical modulators in Mermelstein's systems excludes them from being interference lithography systems.

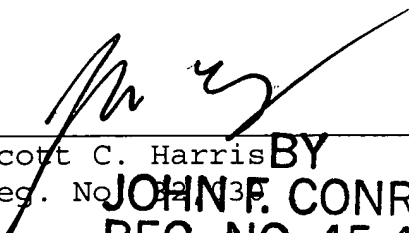
Accordingly, since Mermelstein neither describes nor suggests a device that includes a substantially arbitrary arrangement of contacts having a definition characteristic of interference lithography, amended claim 10 is not anticipated thereby and the rejection should be withdrawn.

Applicant notes that the PTO Form 1449 filed January 21, 2005 was not returned with the Office action. Applicant respectfully requests that the art cited thereon, along with the art cited in the PTO Form 1449 filed March 29, 2005, be considered and the initialed PTO Forms 1449 be returned.

Applicant asks that all claims be allowed. Enclosed is a check for excess claim fees. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 5/23/05

  
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